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ECONOMIC ANALYSIS OF ALTERNATE ROUTES
FROM
VAN NORMAN TO FORT PECK
AND
CIRCLE TO FORT PECK

August 25, 1955

FOREWORD

An analyses of alternate routings from Fort Peck to Van Norman and from Fort Peck to Circle have previously been made in reports dated November 27, 1950 and January 2, 1951. These analyses were based on local traffic as reported at that time and on through traffic which was determined by expanding an origin-destination study taken in the prewar period.

These reports were based on conditions in existence before construction had been accomplished on either FA Route 42 south of Fort Peck or FAS Route 252 northwest of Circle. Construction has progressed on the route south of Fort Peck to the point that some decision must be made concerning the most favorable routing to be followed in the further extension of the highway.

In view of the fact that the previous estimates of through traffic were based on prewar counts, it was decided that a new origin-destination study should be undertaken and that a new analysis of the situation should be made in order to present the latest available information. The origin-destination study was taken on the main highways in the vicinity of Circle during the days of July 13, 14 and 15 of 1954. Vehicles traveling in both directions on these highways were stopped, and the drivers were questioned regarding the origin and destination of their trips. The results of these interviews were used to compute the number of annual trips of through traffic which could be expected on either of the alternate routes south of Fort Peck. The amount of anticipated through traffic was supplemented by counts of local traffic on principal county roads along the general location of the proposed primary routes. An estimate was also made of the amount of recreational traffic which might be expected to use either route in traveling to the shores of Fort Peck Reservoir, and principally to the Rock Creek State Park which is centrally located on the south arm of the reservoir.

The purpose of this report is to compare the amount of traffic which would be served by each of the alternate routes, to compare the monetary value of the benefits which motorists on each route would realize, and to compare the ratio of annual benefits to the annual amortized cost of construction and the annual cost of maintenance on the two routes.

DESCRIPTION OF ROUTES

FA Route 42, as now designated, begins at a point known as Van Norman, on FA Route 15 just east of the McCone County line and extends in a direct northerly line to a point near Rock Creek State Park. It then extends in a general northwesterly direction to the end of the government road on the south side of Fort Peck Dam, and from there the route leads into Glasgow to connect with FA Route 1.

From Van Norman to Rock Creek State Park, the population along the route is quite sparse. Recent mapping shows only four dwellings, and possibly one school house that would be within the immediate service range of this section of the proposed highway. In the vicinity of Rock Creek State Park there are four dwellings, a group of seasonal dwellings and the facilities of the park itself.

The State Park is an important control point in this vicinity. In anticipation of extensive recreational activity at this site, the U. S. Army Engineers built bath houses, a community kitchen and dining hall, outdoor picnic facilities, and other features for the use of recreation seekers. The general isolation of this region and the poor condition of service roads has prevented the full use of these facilities. It is reported that at present the park has a potential of about 1,000 visitors per year; however, the attendance has been lower than this amount in the last two years because of the prevailing low water level in the reservoir.

Between Rock Creek State Park and Fort Peck Dam, the population is also quite sparse, but there are more dwellings served than in the south section of the route. In the vicinity of Fort Peck Dam, the road serves an increasing number of vehicles since all roads in this section of the county converge on the dam crossing.

The western part of McCone County consists generally of arid, rolling land. There is some farming along the creek bottoms, but most of the land is suitable only for grazing. The general unproductivity of the region is indicated by the relative absence of farm dwellings and the wide spacing of these units. It is doubtful that the construction of a standard highway through the region will add materially to the agricultural development of the region. It may be expected, however, that some service establishments will be built along the highway.

In view of the importance of the Rock Creek State Park as a control point in this area, it appears that a common route should be selected between Fort Peck Dam and the park, regardless of alternate routings which might be considered south of the park. For the purpose of this analysis, therefore, the proposed routings may be divided into three sections: The common routing from Fort Peck Dam to Rock Creek State Park, the routing from the park to Van Norman, and the alternate routing from the park to Circle.

The alternate routing from the State park to Circle will follow, insofar as terrain permits, a direct line to the small community of Weldon. From Weldon, the route will extend in a direct line, consistent with service to the local residents, to a point marking the present northwestern terminus of FAS Route 252. FAS Route 252 has been built to secondary standards from this point into Circle and a junction with FA Route 15. In order to meet the standards of a primary highway some relocation of the present construction will be necessary.

There is considerably more development in the vicinity of the proposed routing from Weldon to Circle than there is along the Van Norman routing in the western part of the county. The routing from Weldon to Circle will also serve more people because it serves as a trunk line, gathering traffic from intersecting county roads of some importance. Its function as a trunk road is shown by a comparison of traffic counts taken prior to construction and after construction to

secondary standards. In 1949 the average daily traffic on FAS Route 252 amounted to 57 vehicles per day; in 1954 the traffic had increased to an average of 123 vehicles per day. The connection with Circle also increases the importance of this route since Circle is the county seat of McCone County.

ROUTE LENGTHS

Federal Aid Route 42 from Glasgow to Van Norman is approximately 77 miles long as calculated from lengths of present construction projects, surveys on uncontracted sections, and scaled mileages for intermediate sections. The length is distributed as follows:

From Glasgow to Fort Peck Dam	24.0
Project F 315 (9)	6.7
Project F 315 (10)	8.3
Scaled line to Rock Creek Park	10.5
Scaled line to F 315 (8)	11.5
Project F 315 (8)	<u>16.0</u>
Total	77.0

The alternate route from Glasgow to Rock Creek Park, Weldon, and Circle is approximately 85.5 miles long, with distribution of mileage as shown below:

From Glasgow to Rock Creek Park	49.5
Rock Creek Park to Weldon (scaled)	14.0
Weldon to end of FAS 252 (scaled)	7.0
FAS 252 to Circle (route length)	<u>15.0</u>
Total	85.5

Since the section of highway from Glasgow to Fort Peck Dam is in satisfactory condition and is not in immediate need of reconstruction, this 24 mile section is excluded from estimates of future construction costs and relative benefits.

CONSTRUCTION COSTS

Project No. F 315 (9) has been graded to primary standards for a distance of about 6.7 miles south of Fort Peck Dam. It is estimated that the required surfacing of this project can be accomplished at a cost of \$10,000.00 per mile. The remaining 46.3 miles on this route between the south end of F 315 (9) and the southern terminus of the route at Van Norman will involve complete new construction. The cost of this work is estimated at \$50,000.00 per mile. The estimated construction costs for this route are shown below:

<u>Section of Highway</u>	<u>Type of Work</u>	<u>Length</u>	<u>Cost</u>
Project F 315 (9)	Surfacing	6.7	\$ 67,000.00
Project F 315 (10)	New Construction	8.3	415,000.00
F 315 (10) to Rock Creek	New Construction	10.5	525,000.00
Rock Creek to F 315 (8)	New Construction	11.5	575,000.00
Project F 315 (8)	New Construction	<u>16.0</u>	<u>800,000.00</u>
Average cost per mile	-	53.0	\$2,382,000.00

Assuming an average service life of 20 years on the surfacing and 40 years on the remaining construction items, the foregoing cost of \$2,382,000.00 would be reduced to an average annual amortized construction cost of \$72,800.00. It is estimated that it will cost about \$1,000.00 per mile per year to maintain the 53.0 miles between Fort Peck Dam and Van Norman. On adding this maintenance cost of \$53,000.00 per year to the amortized construction cost, a total annual cost is derived of \$125,800.00 per year for this section of highway.

The figures shown below represent the estimated construction costs for the common routing between Fort Peck Dam and Rock Creek State Park, and the alternate routing from Rock Creek State Park to Weldon and Circle. The projected routing, as determined from a county map, shows that the route between Rock Creek and Weldon would follow high ground, and the routing from Weldon to Circle would follow the general drainage of Horse Creek. Under these conditions, it would appear that required drainage structures would not be so numerous as those encountered on the Rock Creek-Van Norman routing where the highway crosses the drainage courses. However, in the absence of an actual survey confirming this supposition, and in the interest of granting equal treatment to both alternates, it has been decided to use the same figure of \$50,000.00 per mile for the estimated cost of constructing the section of highway between Rock Creek State Park and the end of FAS Route 252 southeast of Weldon.

The entire length of FAS Route 252 has been built to secondary standards throughout. In order to meet primary standards, however, it would be necessary to relocate certain sections to improve the alignment. The roadway also is deficient in width with respect to primary standards and would require widening. There are four major structures which have been constructed on this route, and they are adequate for primary standards.

On granting proper allowance for the retention of structures and the salvaging of a portion of the grading and drainage on this section of highway, an estimated reconstruction cost is derived of slightly less than \$41,000.00 per mile.

The overall cost is shown below:

<u>Section of Highway</u>	<u>Type of Work</u>	<u>Length</u>	<u>Cost</u>
Common section from Ft. Peck Dam to Rock Creek	Surfacing & New Constr.	25.5	\$1,007,000.00
Rock Creek to Weldon	New Construction	14.0	700,000.00
Weldon to FAS 252	New Construction	7.0	350,000.00
FAS 252 into Circle	Reconstruction	15.0	610,000.00
Total		61.5	\$2,667,000.00

Average cost per mile - \$43,365.00

Granting of service lives of 20 years for the surfacing and 40 years for the other construction items results in an amortized annual construction cost of \$82,050.00 for the routing from Fort Peck Dam via Rock Creek State Park and Weldon to Circle. Adding an estimated \$1,000.00 per mile per year for maintenance of this route increase the annual cost by \$61,500.00 to an overall total of \$143,550.00 per year.

TRAFFIC

The origin-destination survey, which was taken near Circle during the month of July, 1954, showed that a total of 159 vehicles per day would be benefited by the construction of the proposed highway from Van Norman to Fort Peck or from Circle to Fort Peck.

Of these vehicles, 39 would have had their travel distance shortened 29 miles by using the Van Norman to Fort Peck route as compared with the present traveled way via Circle and Wolf Point to destinations west of Wolf Point. These same vehicles would have enjoyed a reduction of travel distance of 19 miles on using the Circle-Fort Peck route as compared with the present traveled way via Wolf Point.

An additional 120 vehicles per day would have found their travel distance shortened by 19 miles on the Circle-Fort Peck route, but would have had their travel distance increased by 4 miles on using the Van Norman-Fort Peck route.

In the assignment of through traffic to the alternate routes and in computing their benefits, it was presumed that the entire 159 vehicles per day would have used the Circle-Fort Peck route, but that only 39 vehicles per day would have used the Van Norman-Fort Peck route. It is realized that the average motorist might not hesitate to travel an additional 4 miles on the Van Norman-Fort Peck route to arrive at his destination, however, the fact remains that this additional travel would result in a negative benefit in computing his transportation costs and would reduce the overall ratio of benefits to construction costs.

As a matter of interest, the survey showed that about 20% of the total traffic consisted of vehicles which were entering or leaving the State via U. S. Highway No. 10 at Wibaux. This would appear to be a natural condition since the routing from Circle to Glasgow is a direct extension of U. S. Highway No. 10 from Wibaux to Glendive and would provide the most direct route to U. S. Highway No. 2 for those motorists having destinations in Glasgow and points west.

It was also found that about 13% of the total vehicles which would be benefited by either alternate route consisted of trucks heavier than the panel and pickup category.

In order to make a comparison between relative benefits and costs, it was necessary to estimate the average increase in traffic during the service life of the highway. This increase was estimated at 50%, and the average daily through traffic for the alternate routes was increased to 59 and 239 vehicles per day respectively for the Van Norman-Fort Peck and the Circle-Fort Peck routes.

At the present time, there are only two sections in this area where there is any local traffic of interest. One section is located south of the Fort Peck Dam where the roads from that section of the county converge for the dam crossing. The other is located between Weldon and Circle, and this also represents, to a great extent, the convergence of traffic destined for Circle. Traffic south of the dam averages about 35 vehicles per day for the first 7 miles. Traffic between Weldon and Circle averages about 100 vehicles per day for the 22 mile section.

The traffic between Weldon and Rock Creek State Park and from the park to a point 7 miles south of the dam amounts to about 15 vehicles per day. Since there are no roads which could be considered the present traveled way between Rock Creek State Park and Van Norman, there are no traffic counts available on which an estimate of local traffic could be made for this routing. It would appear, however, that, on the basis of development in this vicinity, local traffic probably would not exceed 5 vehicles per day.

After consideration of all factors, it is estimated that the present local traffic on the Van Norman-Fort Peck route would average 19 vehicles per day throughout its length, and that the local traffic on the Circle-Fort Peck route would average 30 vehicles per day throughout. On computing the allowance for induced traffic and increases in future years, the average local traffic was estimated at 36 and 63 vehicles per day respectively for the Van Norman-Fort Peck and for the Circle-Fort Peck routes during the service life of the highway.

It is believed that, upon construction of a standard highway to serve the Rock Creek State Park, there will be considerable recreational traffic on either of the alternate routes. At the present time, it is doubtful that the recreational traffic to the park would exceed 5 vehicles per day when computed for an annual average. It is estimated, however, that the recreational traffic, in the future when the road is completed, would amount to about 30 vehicles per day on the Van Norman-Fort Peck route and 35 vehicles per day on the Circle-Fort Peck route. The Circle-Fort Peck route is allowed an extra five cars per day because of the shorter travel distance and its better service to population centers.

The following is a summary of estimated future traffic:

<u>Type of Traffic</u>	<u>Van Norman to Fort Peck</u>	<u>Circle to Fort Peck</u>
Local	36	63
Recreational	30	35
Through	<u>59</u>	<u>239</u>
Total	125	337

BENEFITS

Benefits may be defined as the reduction of operating costs, decrease in travel time, and the increase in comfort and convenience which would result through the improvement of highway facilities and the shortening of travel distance.

Each class of traffic as reported above would realize these benefits in varying degrees and for different reasons; therefore, the benefits are analyzed separately.

Since the new construction between Van Norman and Fort Peck and Circle and Fort Peck will not differ materially from the present traveled highway between Circle, Wolf Point, and Glasgow, the benefits to the through traffic will be con-

fined to those resulting from the reduction of travel distance. As explained previously, the 59 vehicles of estimated future through traffic on the Van Norman-Fort Peck route will save 29 miles per trip over the highway as compared with the present traveled way. The 239 vehicles per day of estimated future through traffic on the Circle-Fort Peck route will save 19 miles per trip. In computing the value of these distance savings, the average daily traffic has been converted to annual trips and these trips have been multiplied by the mileage savings per trip. These figures represent the annual savings in vehicle miles, and they in turn are multiplied by figures suggested in an AASHO publication in order to evaluate the monetary worth of the vehicle miles saved.

The following shows the computation of benefits to through traffic:

<u>Item</u>	<u>Van Norman to Fort Peck</u>	<u>Circle to Fort Peck</u>
Average daily future traffic	59	239
Annual trips (x 365)	21,535	87,235
Miles saved per trip	29	19
Annual vehicle-miles saved	624,515	1,657,465
Operating costs savings @ \$.0584/VM	\$ 36,472	\$ 96,796
Time savings @ \$.0336/VM	20,984	55,691
Comfort & convenience @ \$.0060/VM	<u>3,747</u>	<u>9,945</u>
Total Savings	\$ 61,203	\$ 162,432

The local traffic will also enjoy benefits of a somewhat different nature than those accruing to the through traffic. These benefits include a slight shortening of travel distance (computed as 1.0 mile for local traffic on the Van Norman-Fort Peck route and 2.2 miles for local traffic on the Circle-Fort Peck route) and the advantages which will accrue through traveling on a standard highway rather than on the present low standard county roads.

The computation of benefits to local traffic is shown below:

TRAVEL ON PRESENT ROADS

<u>Item</u>	<u>Van Norman to Fort Peck</u>	<u>Circle to Fort Peck</u>
Average daily future traffic	36	63
Annual trips (x 365)	13,140	22,995
Distance on present roads	54.0	63.7
Vehicle-miles on present roads	709,560	1,464,782
Operating cost per mile	\$.0706	\$.0674
Time cost per mile	.0673	.0631
Comfort & convenience per mile	<u>.0120</u>	<u>.0112</u>
Total cost per mile	\$.1499	\$.1417

<u>Item</u>	<u>Van Norman to Fort Peck</u>	<u>Circle to Fort Peck</u>
Total cost per route (VM x Cost)		
Operating costs	\$ 50,095	\$ 98,726
Time costs	47,753	92,428
Comfort & convenience	<u>8,514</u>	<u>16,406</u>
TOTAL COST ON PRESENT ROADS	\$ 106,362	\$ 207,560

TRAVEL ON NEW HIGHWAY

Annual trips	13,140	22,995
Distance on new construction	53.0	61.5
Vehicle-miles on new construction	696,420	1,414,193
Operating cost per mile	\$.0584	\$.0584
Time cost per mile	.0336	.0336
Comfort & convenience per mile	<u>.0060</u>	<u>.0060</u>
Total cost per mile	\$.0980	\$.0980

Total cost per route (VM x Cost)

Operating costs	\$ 40,671	\$ 82,589
Time costs	23,400	47,517
Comfort & Convenience	<u>4,178</u>	<u>8,485</u>
TOTAL COST ON NEW CONSTRUCTION	\$ 68,249	\$ 138,591
COST OF TRAVEL ON PRESENT ROADS	\$ 106,362	\$ 207,560
COST OF TRAVEL ON NEW HIGHWAY	<u>-68,249</u>	<u>-138,591</u>
NET SAVINGS	\$ 38,113	\$ 68,969

No attempt is made in this analysis to estimate the benefits which would accrue to the recreational traffic on the route. In order to estimate benefits, it is necessary to know the present operating conditions and also the conditions that would prevail for the same traffic when the new highway was built. No information is available concerning the origin, destination, or routing of present recreational trips; therefore, it is impossible to compare the present conditions with improved conditions which would result from new highway construction. In addition, it is probable that any benefits would be approximately equal for both routes and would not materially affect the results of the analysis.

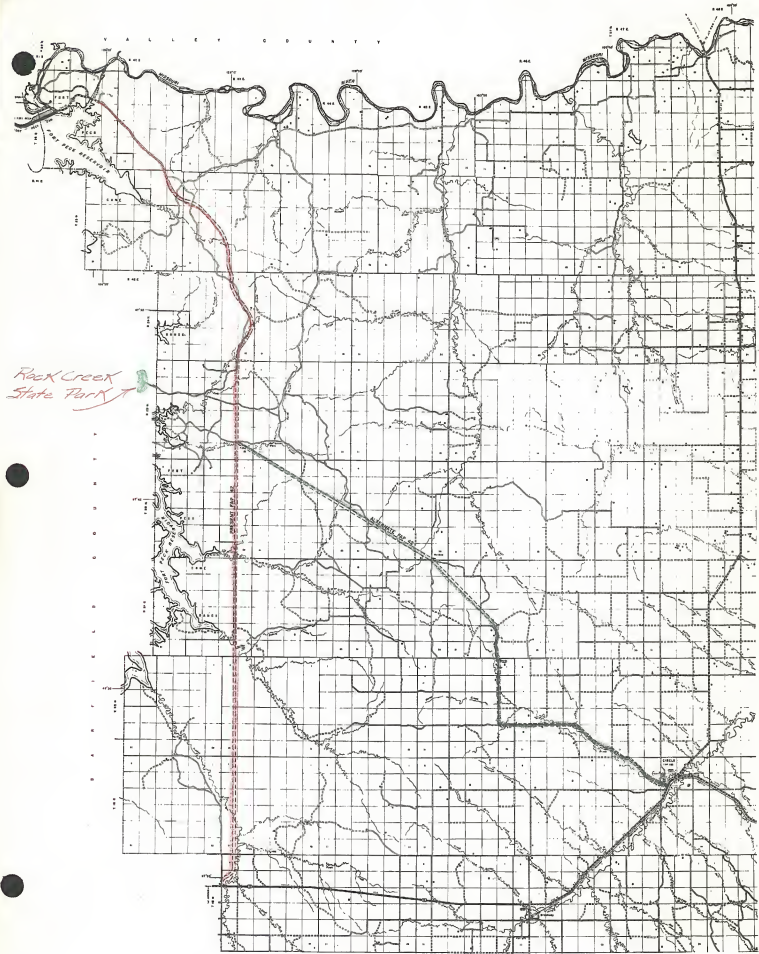
SUMMARY

The primary purpose of this analysis is to compare the combined estimated annual construction and maintenance costs for the new highway with the estimated annual benefits which would result from the new construction, in order to determine which alternate routing would provide the greatest benefit in relation to cost.

The results of the analysis are summarized below:

	<u>Van Norman to Fort Peck</u>	<u>Circle to Fort Peck</u>
<u>Operating Cost Benefits</u>		
Through Traffic	\$ 36,472	\$ 96,796
Local traffic	<u>9,424</u>	<u>16,137</u>
Total	45,896	112,933
<u>Time Savings Benefits</u>		
Through Traffic	20,984	55,691
Local Traffic	<u>24,353</u>	<u>44,911</u>
Total	45,337	100,602
<u>Comfort & Convenience Benefits</u>		
Through Traffic	3,747	9,945
Local Traffic	<u>4,336</u>	<u>7,921</u>
Total	8,083	17,866
<u>ALL BENEFITS</u>		
Through Traffic	61,203	162,432
Local Traffic	<u>38,113</u>	<u>68,969</u>
Total	\$ 99,316	\$ 231,401
<u>ANNUAL BENEFITS</u>	\$ 99,316	\$ 231,401
<u>ANNUAL COSTS</u>	\$ 125,800	\$ 143,550
RATIO: BENEFITS/COSTS	0.7894	1.6120

The Circle to Fort Peck alternate would be the most favorable routing with a benefit return of \$1.61 for each \$1.00 invested in construction and maintenance. The Van Norman Fort Peck routing would have a benefit return equal to \$0.79 for each \$1.00 invested in construction and maintenance.



*Rock Creek
State Park*

MAP TO ACCOMPANY ECONOMIC ANALYSIS OF
ALTERNATE EXTENSIONS OF FAP ROUTE 42